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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS CORRECTION OR AMENDMENT

[Translation done.]

Drawing selection Representative draw

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention is provided with the image display terminal unit expressing the two-dimensional or three-dimensional virtual space where the operator can operate freely with his intention (operation), It is related with the inner force sense presenting device which gave the operator the sense of force given by the virtual contact with the virtual air blasting receiving object displayed as the other selves (thing etc. which an operator or its operator possesses) of the virtual object arbitrarily displayed in the virtual space, and an operator from the wind pressure.
[0002]
[Description of the Prior Art]As a conventional device which gives an operator a sense of force in virtual environment, The manipulator type which attaches a motor to each articulated axis of a manipulator, drives the motor, controls the reaction force of each articulated axis, and presents a sense of force (Asano) Yano, Iwata : "component-engineering development of the operation simulation system in the virtual environment using a force display." Virtual reality society convention collected papers, Vol.1, pp.95-98, (1996.10), Or the ring which stretched thread is put on an operator's finger, and there are a thread type (Sato, other: "proposal of space interface device SPIDAR", IEICE TRANSACTIONS, 74, D-2, 7,887/889 (1991)) etc. which attach the other end of the thread to a motor, and present a sense of force by control of the tension of thread.
[0003]
[Problem(s) to be Solved by the Invention]However, the portion which the device of these former requires time and effort for attachment and detachment of a device, and supports a device is provided in the exterior of human being's

body, and operation restrictions of an operator being unable to move freely pose a problem.

[0004]This invention was made in view of such a problem, and it is made just to have some which the purpose makes a wind pressure the sense of force in virtual space, give an operator, catch a wind pressure to the operator side, and can be told to the operator as a pressure, Let the inner force sense presenting device whose flexibility of an operator's motion increased be an offer plug.

[0005]
[Means for Solving the Problem]An image display terminal unit with which the 1st invention for solving an aforementioned problem expresses a virtual object and a virtual air blasting receiving object to virtual space, And said virtual object and a virtual space system which has a virtual space control means which controls said virtual space according to a state of said virtual air blasting receiving object, A blast reception means which has a pressure presentation part which shows an operator's body and a possession thing as a pressure a wind pressure which an air blasting receive section which catches a wind, and this air blasting receive section received, According to information, including a position of an air blasting receive section detection means to detect a position of this blast reception means, direction, etc., and said blast reception means detected by this air blasting receive section detection means, direction, etc., An air blasting receive section projection means which projects an object which attached said blast reception means or makes it a part on said virtual space as said virtual air blasting receiving object, A virtual contact calculating means which calculates these both virtual contact state according to a state of said virtual air blasting receiving object and said virtual object, An air blasting discharge means which emits a wind to said air blasting receive section, and an air blasting discharge calculating means which calculates a wind which said air blasting discharge means emits according to a calculation result of said virtual contact calculating means, It constituted so that it might have an air blasting control means which controls a wind which said air blasting discharge means emits according to a calculation result of said air blasting discharge calculating means.

[0006]As for the 2nd invention, in the 1st invention, said virtual space system is further provided with a remote virtual space reflection means, This remote virtual space reflection means expressed said virtual object sent from other virtual space systems via a communication network to said virtual space, and it constituted so that this virtual object might be transmitted to a virtual space system besides the above via said communication network.

[0007]As for the 3rd invention, in the 1st invention, said virtual space system is further provided with a remote virtual space reflection means, This remote virtual space reflection means expresses said virtual object sent from other virtual space systems via a communication network to said virtual space, and. It constituted so that said virtual air blasting receiving object might be transmitted to a virtual space system besides the above as a virtual object via said communication network.

[0008]In the 1st thru/or the 3rd invention, said blast reception means constituted the 4th invention as it had an air blasting reception control part which controls area or shape which catches a wind of said air blasting receive section according to a state of said virtual air blasting receiving object and a virtual object.

[0009]In the 1st thru/or the 4th invention, the 5th invention said blast reception means, It had a pressure detector which detects a pressure shown by said pressure presentation part, and it constituted so that said virtual space control

means might control said virtual space according to a state of said air blasting receiving object and said virtual object, corresponding to a pressure which said pressure detection means detected.
[0010]
[Embodiment of the Invention][A 1st embodiment] Drawing 1 is a key map of a 1st embodiment of this invention. The inner force sense presenting device of this 1st embodiment, When showing the sense of force at the time of the virtual contact with the virtual air blasting receiving object 1a as the operator's 3 other selves (thing etc. which an operator or its operator possesses) and the virtual object 1b (drawing 1 (a)) in one in virtual space of the three dimensions expressed with the image display terminal unit 11a, From the air blasting discharge means 2, the wind 4 is given to the operator's 3 the body and possession thing, it detects by the blast reception means 5 by making the wind into a pressure, and a sense of force is shown to the operator's 3 the body and possession thing as the pressure P (drawing 1 (b)).
[0011]Drawing 2 is a lineblock diagram of the inner force sense presenting device of this embodiment. The above mentioned blast reception means 5 is provided with the following.
The air blasting receive section 5a which catches the wind emitted from the air blasting discharge means 2.
The pressure presentation part 5b which shows a wind pressure when the air blasting receive section 5a receives a wind to the operator's 3 the body and possession thing as the pressure P.

[0012]This blast reception means 5 should just be the composition that the field which can catch that wind pressure can be told to the operator 3 by making the wind pressure of owner Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. into a pressure, when a wind is received. Using a concave field is also considered so that a wind pressure can be caught efficiently, but the shape of this field gives a wind pressure there, and it may be made to make it tell it as a pressure by attaching to the operator's 3 the body and possession thing the board which has a mere field, a concave umbrella, etc. The field of the possession thing itself, the operator's 3 clothes, etc. use it, when the field available as the blast reception means 5 is already equipped, and it may be made to show a pressure to the operator 3 who possesses by giving a wind pressure to these possession thing etc.
[0013]6 is an air blasting receive section detection means to detect the position of said blast reception means 5, and direction. As this air blasting receive section detection means 6, there are a detection means using a magnetic sensor or infrared rays, a detection means to use the image analysis by marking, etc. The movement speed of the blast reception means 5 (operator 3), the move direction, acceleration, etc. can be computed by the ability to use the position information and the direction information which are detected by this air blasting receive section detection means 6, and it can also use as a status value of the air blasting receive section 5a.
[0014]7 is an air blasting receive section projection means, and projects the object which attached said blast reception means 5, or makes it a part on the virtual space 1 as the virtual air blasting receiving object 1a according to the position information on the blast reception means 5 detected by the air blasting receive section detection means 6, and direction information.
[0015]8 is a virtual contact calculating means and calculates the virtual contact state of both in the virtual space 1 according to the state of the virtual air blasting receiving object 1a in the virtual space 1, and the virtual object 1b.

That is, the state of whether contact occurred in the virtual space 1 or there is possibility of contact from each position and moving track, contacting how is computed.

[0016]9 is an air blasting discharge calculating means, and calculates the position of the wind which the air blasting discharge means 2 emits, direction, and strength based on the result calculated from the virtual contact calculating means 8.

[0017]10 is an air blasting control means and controls the position of the wind which said air blasting discharge means 2 emits based on the result calculated by the air blasting discharge calculating means 9, direction, and strength. As an example of this air blasting discharge means 2, there are a fan, an air pump, an air compressor, etc. and the position and direction to air blasting by control of the strength of that air blasting, the change of one or more air blasting discharge parts, an angle, a position, etc., etc. are controlled by the air blasting control means 10.

[0018]As the concrete method of control of the strength air blasting of the air blasting control means 10, There are the method of changing ON and OFF of air blasting and the air capacity per unit time by controlling the voltage supplied to the air blasting discharge means 2 and frequency, changing the air capacity per unit area by controlling the strength of air blasting and controlling the area of the air blasting injection hole of the air blasting discharge means 2, and controlling the strength of air blasting, etc.

[0019]The above mentioned image display terminal unit 11a with which 11 is a virtual space system and the operator 3 expresses the three-dimensional virtual space 1 which can do operation (operation) freely with its intention, It has the virtual space control means 11b which controls the virtual space 1 (image) according to the state of the virtual object 1b and the virtual air blasting receiving object 1a.

[0020]As the image display terminal unit 11a, it is a standard size, or a life-size display and the thing projected on HMD etc. can be used, and a monocular vision and the thing which carries out watching with many eyes (corporal vision) can also be used.

[0021]Next, the utilizing method of the inner force sense presenting device by this embodiment is explained in detail. Drawing 3 is a figure for explaining the flow of the processing. Here, the example which receives the event of the virtual contact by the virtual object 1b by showing the operator's 3 the body and possession thing a sense of force is explained.

[0022]first, portions [portions] (the operator's 3 the body, a possession thing, etc.) to make it receive virtual contact according the blast reception means 5 to the virtual object 1b -- 1 -- or more than one are attached. However, the field of a possession thing, the operator's 3 clothes, etc. use it, when the blast reception means 5 is already equipped. The position of the blast reception means 5 in that case turns into a position etc. of the already equipped portion (S101).

[0023]Next, about each blast reception means 5, the air blasting receive section detection means 6 always detects the position in the virtual space 1, and direction, and the object which attached the blast reception means 5, or makes it a part is projected on the virtual space 1 as the virtual air blasting receiving object 1a (S102).

[0024]Next, the virtual space system 11 generates the virtual object 1b, and it expresses in the virtual space 1. (S103).

[0025]Next, according to the state of the virtual air blasting receiving object 1a and the virtual object 1b, the virtual contact state of both in said virtual space 1 is calculated by the virtual contact calculating means 8 (S104).

[0026]When virtual contact has occurred as a result of this calculation, The wind emitted by the air blasting discharge means 2 based on the contact state which the virtual contact calculating means 8 computed by the air blasting discharge calculating means 9 is calculated (S106), and the position, direction, and strength to which the air blasting discharge means 2 emits a wind by the air blasting control means 10 are controlled (S107).

[0027]Thus, by the position and orbit in the virtual space 1 of the virtual object 1b, the position of the blast reception means 5 attached to the operator's 3 the body and possession thing, or direction the virtual contact calculating means 8, It is calculated whether in the virtual space 1, the virtual contact with said virtual object 1b and the virtual air blasting receiving object 1a occurred, The wind which the air blasting discharge means 2 should emit by the air blasting discharge calculating means 9 if virtual contact has occurred is calculated, The air blasting control means 10 controls the air blasting discharge means 2 that the virtual object 1b has so that [the wind from the air blasting discharge means 2] it may be applied by the air blasting receive section 5a corresponding to the virtual air blasting receiving object 1a which carries out virtual contact.

[0028]According to the state of said virtual object 1b or the projected virtual air blasting receiving object 1a when a wind is emitted, the virtual space 1 is controlled by the virtual space control means 11b from the air blasting discharge means 2 (S108).

[0029]If said virtual space system 11 makes the contact event to the virtual air blasting receiving object 1a corresponding to the operator 3 generate again according to the expressed virtual space 1 (S109), they will be repeated again.

[0030]There is the beach volleyball, tennis, and mole beat game "side etc. to strike" etc. as the virtual space 1 which makes the contact event by the virtual object 1b receive as a concrete utilizing method of the inner force sense presenting device explained above.

[0031]the operator's 3 the body, a possession thing, etc. are attached to portions [portions / the operator 3] (for example, thing seen and built on the operator's 3 hand, an arm and a racket, and hammer) to make it receive virtual contact according the blast reception means 5 to the virtual object 1b at this time. Or fields, such as the operator's 3 clothes and possessed racket, and a hammer, are used as the blast reception means 5 (S101).

[0032]And the air blasting receive section detection means 6 always detects the position of the blast reception means 5, and direction. The racket and hammer which are the operator's 3 bodily part and possession thing as an object which attached the blast reception means 5 or make it a part are projected into the virtual space 1 as the virtual air blasting receiving object 1a (S102).

[0033]Next, the virtual object 1b is generated as a virtual ball or a virtual mole, and it expresses in the virtual space 1 (S103).

[0034]When the time of flying a virtual ball to the virtual space 1 and a virtual mole run out by this, performing the acts that the operator 3 collides with a virtual ball, like that the operator 3 strikes back a virtual ball and the operator 3 strikes a virtual mole as contact with the virtual air blasting receiving object 1a is assumed. If the operator 3 causes action, such as moving the portion which attached the blast reception means 5, at this time, The virtual contact calculating means 8 calculates the virtual contact state in the virtual space 1 between the both according to the state of the virtual air blasting receiving object 1a (the racket and hammer which are the operator's 3 bodily part and possession thing), and the virtual object 1b (a virtual ball and a virtual mole).

[0035]Thus, it is calculated whether the virtual contact with the virtual object 1b, and the operator's 3 body and a possession thing occurred from the position

in the virtual space 1 of the virtual object 1b, an orbit, the position of the blast reception means 5 attached to the operator's 3 the body and possession thing, or direction (S104).

[0036]If virtual contact has occurred, the air blasting discharge calculating means 9 from the contact state, The air blasting control means 10 controls the air blasting discharge means 2, and a wind is emitted from the air blasting discharge means 2 so that [a wind] the wind which the air blasting discharge means 2 emits may be calculated (S106) and it may be applied by the blast reception means 5 which the virtual object 1b contacts (S107).

[0037]The virtual air blasting receiving object 1a (the operator's 3 body a part) when a wind is emitted from the air blasting discharge means 2 Or according to the state of the racket and hammer which are possession things, and the virtual object 1b (a virtual ball and a virtual mole), the virtual space control means 11b as an image which the virtual object 1b contacted, The virtual mole from which a virtual ball rebounds withdraws, or the image of a virtual mole style changing is expressed (S108). According to the state where it rebounded or struck, the virtual ball flies to the operator 3 again, or they are repeated -- a virtual mole runs out.

[0038]When expressing the image of the virtual object 1b which virtual contact generates to the virtual space 1 as an option which controls the virtual space 1, The method of carrying out expressed according to the position etc. of the virtual air blasting receiving object 1a projected into the virtual space 1 which is an object which attached the blast reception means 5 or makes it a part can also be enforced.

[0039]Drawing 4 is a figure for explaining the flow of processing in this case. This replaces Step S103 which suited drawing 3 by step S103'. In this step S103', according to the state of the virtual air blasting receiving object 1a and the virtual object 1b, the virtual space 1 is controlled by the virtual space control means 11b, and the image of the virtual object 1b which starts a contact event is expressed to a request.

[0040]The concrete utilizing method in this case is explained below. Here, the mole beat game "side [it is struck]" is considered as the virtual space 1 which makes the contact event from the virtual object 1a receive.

[0041]At this time, the blast reception means 5 is attached to portions [portions / the operator 3] (for example, an operator's head etc.) to make it receive the virtual contact from the virtual object 1b like the operator's 3 body, or a possession thing, or an operator's clothes etc. are used (S101).

[0042]And the position of the blast reception means 5 and direction are detected. Some the operator's 3 bodies (for example, an operator's head etc.) which are objects which attached or make the blast reception means 5 a part are projected into the virtual space 1 as a virtual mole which is the virtual air blasting receiving object 1a (S102).

[0043]This is that the operator 3 moves the position, and is a game supposing the projected virtual mole performing receipts and payments from the virtual hole made in the virtual space 1, and the virtual mole being struck with a virtual hammer.

[0044]that jump out of the hole specified by a virtual mole, or beyond fixed time has come out from the hole **** -- etc.. When the conditions of having jumped out of the hole are fulfilled, it is considered as that of the basis which the virtual contact with the virtual object 1b generates, a virtual hammer is generated as the virtual object 1b, and a virtual hammer is expressed according to a motion of a virtual mole (S103').

[0045]The operator 3 causes action, such as moving the portion which attached

the blast reception means 5, The virtual contact calculating means 8 calculates a virtual contact state in the virtual space 1 according to the state of the virtual air blasting receiving object 1a (virtual mole) and the virtual object 1b (virtual hammer) where some the operator's 3 bodies were projected (S104). This virtual contact state is in the state where a virtual hammer strikes a virtual mole, for example.

[0046]So that [the air blasting discharge calculating means 9 calculates the wind which the air blasting discharge means 2 emits from the contact state (S106), and / a wind] it may be applied by the air blasting receive section 5a which the virtual object 1b contacts, if virtual contact has occurred, The air blasting control means 10 controls the air blasting discharge means 2, and a wind is emitted from an air blasting discharge means (S107).

[0047]According to the state of the virtual air blasting receiving object 1a (virtual mole) and the virtual object 1b (virtual hammer) where some the operator's 3 bodies when the wind was emitted were projected, the virtual space control means 11b controls virtual space from the air blasting discharge means 2. For example, the image of the position in the virtual space 1 of the operator 3 who shone [which was found to the virtual mole from which a virtual hammer changes] changing as an image which the virtual object 1b contacted is expressed (S108).

[0048]According to the state where it was struck, they -- the operator 3 runs out of a virtual hole again -- are repeated (S109).

[0049][A 2nd embodiment] Drawing 5 is a lineblock diagram of the inner force sense presenting device by a 2nd embodiment of this invention. Here, two inner force sense presenting devices shown in drawing 2 are provided, and the virtual space system 11 of each inner force sense presenting device is connected via the communication network 12. Each inner force sense presenting device shows both an operator's bodies and possession things a sense of force so that reaction force may be bidirectionally exchanged virtually among operators via the communication network 12. And it enables it to display the operator's 3 other self (virtual air blasting receiving object 1a) on each inner force sense presenting device, and the operator 3 expresses also here the three-dimensional virtual space 1 which can do operation (operation) freely with its intention by operating one's other self. The other self of the operator who operates other inner force sense presenting devices also makes this virtual space 1 express.

[0050]The virtual space control means 11b of the virtual space system 11 controls the virtual space 1 the same with having been shown in drawing 2 according to the state of the virtual air blasting receiving object 1a projected by the air blasting receive section projection means 7 and the generated virtual object 1b. The position information on the virtual object 1b which 11c is a remote virtual space reflection means, and was expressed by the virtual space control means 11b, direction information was transmitted to other virtual space systems via the communication network 12, and the position information on the virtual object 1b and direction information were received -- being concerned -- others -- in the virtual space 1, it has same remote virtual space reflection means 11c to express the virtual object 1b to the self virtual space 1. The remote virtual space reflection means 11c may transmit the virtual air blasting receiving object 1a of the self virtual space 1 to other virtual space systems as the virtual object 1b. Other composition is as the same as the composition of drawing 2 explained.

[0051]Drawing 6 is a figure for explaining the flow of processing of the inner force sense presenting device of this 2nd embodiment. First, the operator's 3 the body, a possession thing, etc. are attached to a portion [a portion / the operator

3] to make it receive virtual contact according the blast reception means 5 which has the pressure presentation part 5b which presents as a pressure the wind pressure which the air blasting receive section 5a which catches a wind, and its air blasting receive section 5a caught to the virtual object 1b. However, the field of a possession thing, an operator's clothes, etc. use it, when the blast reception means 5 is already equipped. The position of the blast reception means in that case turns into a position etc. of the already equipped portion (S201).

[0052]Next, about said each blast reception means 5, the air blasting reception detecting means 6 always detects the position in the virtual space 1, and direction, and the object which attached or makes the blast reception means 5 a part is projected on the virtual space 1 as the virtual air blasting receiving object 1a (S202).

[0053]Next, a virtual space system generates the virtual object 1b, and expresses it in the virtual space 1. (S203).

[0054]Next, the virtual contact calculating means 8 calculates the virtual contact state in said virtual space 1 between both according to the state of the virtual air blasting receiving object 1a and the virtual object 1b (S204).

[0055]When virtual contact has occurred by the above, The air blasting discharge calculating means 9 calculates the position of the wind which air blasting ****** 2 emits based on the contact state computed by the virtual contact calculating means 8, direction, and strength (S206), and, as for the air blasting control means 10, the air blasting discharge means 2 controls discharge **** for a wind based on this calculation (S207).

[0056]According to the state of the virtual air blasting receiving object 1a projected by the air blasting receive section projection means 7 when the wind was emitted, and the virtual object 1b, the virtual space 1 is controlled by the virtual space control means 11b from said air blasting discharge means 2 (S208).

[0057]The position information on the virtual object 1b expressed by the virtual space control means 11b and direction information are transmitted to other virtual space systems 11 via the communication network 12 by the remote virtual space reflection means 11c (S209). The position information on the virtual object 1b transmitted from remoteness and direction information are made to reflect in the self virtual space 1 (S210).

[0058]If a contact event is made to generate to an operator more nearly again than the above virtual contact having occurred even in the remote virtual space 1 etc. at this time (S211), same processing will be performed again.

[0059]A remote operator and the virtual space 1 are shared between generating virtual contact mutually in both virtual space via the communication network 12, and the above enables it to experience the exchange of virtual reaction force.

[0060]The virtual space system 11 with which the same virtual contact event happens as a concrete utilizing method of this embodiment is connected in the communication network 12, it is that the virtual object 1b goes both sides back and forth, and there is a method of exchanging the contact event from the virtual object 1b. For example, it is a utilizing method which connects virtual space systems explained by said 1st embodiment, such as beach volleyball and tennis, in a communication network.

[0061]things -- coming -- it is a portion [a portion / the operator 3] to make it receive virtual contact according the blast reception means 5 to the virtual object 1b. it attaches to an operator's body, possession things, etc. (for example, thing seen and built at an operator's hand and arm, and the racket), or the field

of an operator's clothes, the racket of a possession thing, etc. is used as the blast reception means 5 (S201).

[0062]And the air blasting receive section detection means 6 detects the position and direction. It projects into the virtual space 1 by using as the virtual air blasting receiving object 1a the racket which is an object which attached or makes the blast reception means 5 a part and which is an operator's bodily part and possession thing (S202).

[0063]A virtual ball is generated as the virtual object 1b, and it expresses in the virtual space 1 (S103).

[0064]When this flies the virtual ball in which virtual contact takes place to the virtual space 1, performing acts, like that the operator 3 collides with a virtual ball and the operator 3 strikes back a virtual ball is expected as contact with the virtual air blasting receiving object 1a. If the operator 3 causes action, such as moving the portion which attached the blast reception means 5, at this time, The virtual contact calculating means 8 calculates a virtual contact state in between said virtual skies 1 according to the state of the virtual air blasting receiving object 1a (racket which is the operator's 3 bodily part and possession thing), and the virtual object 1b (virtual ball) (S204).

[0065]If virtual contact has occurred by the above, the air blasting discharge calculating means 9, Based on the contact state which the virtual contact calculating means 8 computed, the wind which the air blasting discharge means 2 emits is calculated (S206), and the air blasting control means 10 controls the wind emitted from the air blasting discharge means 2 so that [a wind] it is applied by the blast reception means 5 which the virtual object 1b contacts (S207).

[0066]According to the state of the virtual air blasting receiving object 1a (RAKETSU which is the operator's 3 bodily part and possession thing) when a wind is emitted from the air blasting discharge means 2, and the virtual object 1b (virtual ball), As an image which virtual OBUJIEKU 1b contacted, the virtual space control means 11b expresses an image, like a virtual ball rebounds (S208).

[0067]It transmits to the virtual space system 11 of another side via the communication network 12, and the image of the virtual ball which was expressed by the virtual space control means 11b and which rebounded is made to reflect as an image etc. to which the ball which rebounded upon the remote virtual space 1 has flown (S209).

[0068]When the operator of the virtual space system 11 in the remote place concerned performs acts, such as striking back the virtual ball, By what you receive the position information on the virtual ball, and direction information (S210), and is made to generate a contact event again from this (S211). share a remote operator and the virtual space 1 via the communication network 12, exchange virtual reaction force, and the ball of imagination strikes each other -- etc. -- it becomes possible to experience.

[0069]The virtual space system with which a different virtual contact event happens as an option is connected in a communication network, and there is a method of exchanging a contact event by one virtual air blasting receiving object 1a of each other being reflected as the virtual object 1b which starts a contact event on the other hand.

[0070]the virtual mole is carried out ["the side struck" which saw and looked up to each operator to the virtual mole] "the side to strike", and the concrete methods include virtual space systems, such as a mole beat game which connects between both in the communication network 12, as a 1st embodiment explained.

[0071]Drawing 7 is the key map. As the virtual space 1 which makes the contact event from the virtual object 1b receive, the virtual space system 11A (drawing 7 (a)) of "the side to strike" and the virtual space system 11B (drawing 7 (b)) of "the side struck" shall be connected in the communication network 12. it attaches to what etc. saw and built the blast reception means 5 as what is struck on the hand and hammer of operators, such as the operator's 3 the body, a possession thing, etc., in the virtual space system 11A of "the side to strike", or let fields, such as the hammer, be the blast reception means 5.

[0072]On the other hand, in the virtual space system 11B of "the side struck", as a place struck, the operator's 3 the body, a possession thing, etc. attach the blast reception means 5 to an operator's head, a hand, etc., or the field of an operator's clothes etc. is used as the blast reception means 5.

[0073]Here, the blast reception means 5 "by the side of a beat" should be made into the field of a hammer, and should attach the blast reception means 5 of "the side [it is struck]" to the operator's 3 head.

[0074]About each blast reception means 5, the position in the virtual space 1 and direction are detected, and it projects into the virtual space 1 by using as the virtual air blasting receiving object 1a the head of each operator 3 who is an object which attached or makes each blast reception means 5 a part, and the hammer which is possession things.

[0075]here, a hammer is seen and built on a virtual hammer in the "beat side", an operator's head is seen and built by "a side [it is struck]" to a virtual mole as the virtual air blasting receiving object 1a, and it projects into the virtual space 1 by the side of each as the virtual air blasting receiving object 1a. In this case, the virtual object 1b which starts a contact event is the virtual mole reflected from "the side [it is struck]", and it serves as a virtual hammer reflected from the "beat side" by "a side [it is struck]" at the "beat side."

[0076]By the operator 3 of the virtual space system 11B being projected as a virtual mole of the virtual space system 11B, and a virtual mole being further reflected in the virtual space system 11A. By the impaction efficiency of the operator 3B of the virtual space system 11B, the virtual mole of the virtual space system 11A comes out from a hole, or it enters. By the hammer of a possession thing being projected, projecting in the system 11A between imagination, and striking a virtual mole with a virtual hammer. Since the virtual contact of a virtual mole and a virtual hammer which is the virtual object 1b takes place, according to the state of a virtual mole and a virtual hammer, a virtual contact state is computed from the virtual contact calculating means 8.

[0077]If virtual contact has occurred, the air blasting control means 10 will control the air blasting discharge means 2, and a wind will be emitted from the air blasting discharge means 2 so that [a wind] the wind emitted from the air blasting discharge calculating means 9 may be computed and it may be applied by the air blasting receive section 5a which a virtual object contacts.

[0078]According to the state of a virtual mole and a virtual hammer, the virtual space 1 is controlled by the virtual space control means 11b. For example, the image of the style of a virtual mole from which a virtual mole withdraws changing as an image which carried out virtual contact is expressed.

[0079]By the remote virtual space reflection means 11c, the position information on the virtual hammer of the virtual space system 11A, Direction information is transmitted to the virtual space system 11B through the communication network 12, and the information on the virtual hammer as the virtual object 1b which received by the remote virtual space reflection means 11c is reflected in the virtual space 1 in the virtual space system 11B. Virtual contact with this virtual hammer and a virtual mole takes place similarly, same

processing is performed, and a wind is hit to the blast reception means 5 given to the head of the operator 3 of the virtual space system 11B according to the state of a virtual hammer and a virtual mole.

[0080]Thus, a remote operator and the virtual space 1 are shared between performing the same operation as the above and returning virtual contact again even in the virtual space of the other party via the communication network 12, and it becomes possible to experience the exchange of virtual reaction force, such as a virtual mole beat game (drawing 7 (c)).

[0081][A 3rd embodiment] Drawing 8 is a lineblock diagram of a 3rd embodiment of this invention. Control of the wind which ventilates the blast reception means 5 attached in a 1st and 2nd above-mentioned embodiment in order to show the operator's 3 the body and possession thing a sense of force, That is, although the air blasting discharge means 2 is performing the position which emits a wind, direction, and control of strength by the air blasting control means 10 according to the state of the virtual air blasting receiving object 1a in the virtual space 1, and the virtual object 1b, The air blasting reception control part 5c is newly formed in the blast reception means 5, and the air blasting reception control part 5c controls the area and shape which catch a wind by this embodiment according to the state of the virtual air blasting receiving object 1a and the virtual object 1b. That is, it is made to control the sense of force to show not only by the air blasting discharge means 2 side but by the blast reception means 5 side.

[0082]Control of the wind pressure to catch can be performed by controlling the area and angle about the field which catches the wind of the air blasting receive section 5a. The concrete example is shown in drawing 9. The air blasting receive section 5a is constituted from the shuttlecock 13 (drawing 9 four sheets) of the flat surface which catches the wind of two or more sheets, To the direction on which a wind blows that feather 13, to parallel (drawing 9 (a) right-hand side), an angle is changed continuously and the wind pressure to catch is controlled by every [a predetermined angle] or controlling this angle from it being vertical (drawing 9 (a) left-hand side). It can also constitute in the shape of a trumpet shape so that those shuttlecocks 13 may open and close to a concave (drawing 9 (b)). As other examples, the field which catches the wind of the air blasting receive section 5a is folded up or extended, and there is also the technique of controlling the area which catches a wind, and shape.

[0083]The control content controls the quantity of the wind pressure caught by the air blasting reception control part 5c according to the position of the virtual air blasting receiving object 1a which is an operator's body and the projection of a possession thing which strike it back virtually, and direction, corresponding to the speed of the virtual object 1b which performs virtual contact.

[0084][A 4th embodiment] Drawing 10 is a lineblock diagram of a 4th embodiment of this invention. Here, when showing the operator's 3 the body and possession thing a sense of force, a pressure when the pressure detector 5d which detects the pressure shown by the pressure presentation part 5b is also formed in the blast reception means 5 and a wind pressure is received in it is measured. And corresponding to the state of the virtual air blasting receiving object 1a in the virtual space 1, and the virtual object 1b, according to the pressure which the pressure detection means 5d detected, the virtual space control means 11b is controlled, and the virtual space 1 is controlled.

[0085]There are a pressure sensor etc. as an example of the pressure detector 5d. As a utilizing method, when striking back the virtual object 1b, detect a pressure, and the detected pressure is made to reflect in the states where the

virtual object 1b rebounds, such as speed, and an image is expressed.
[0086]
[Effect of the Invention]As mentioned above, according to the inner force sense presenting device of this invention, a sense of force can be shown to the operator who operates the virtual air blasting receiving object of virtual space by catching a wind pressure using the pressure. Since the apparatus which exaggerated equipment did not have to be carried out, and an operator equips or possesses by this, and was installed by immobilization is unnecessary, an operator becomes movable in the increase of the flexibility of a motion, and arbitrary positions.

[Translation done.]